ENGINEERING-EDUCATION

Bulletin of the

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VOL. X LANCASTER, PA., APRIL, 1920 NO. 8

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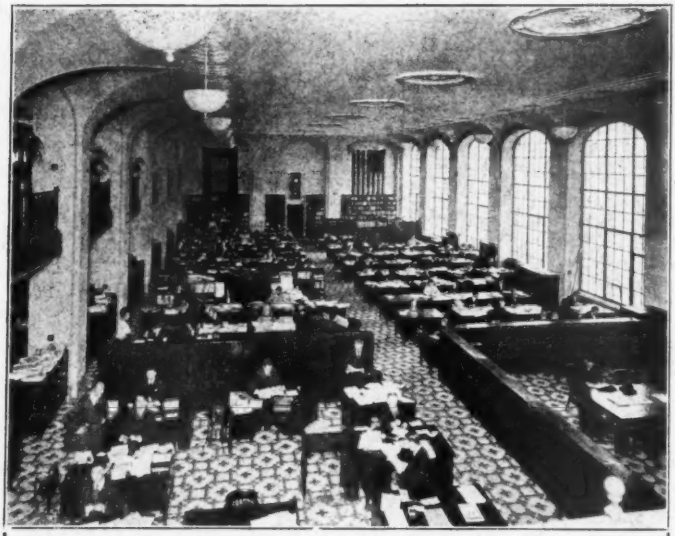

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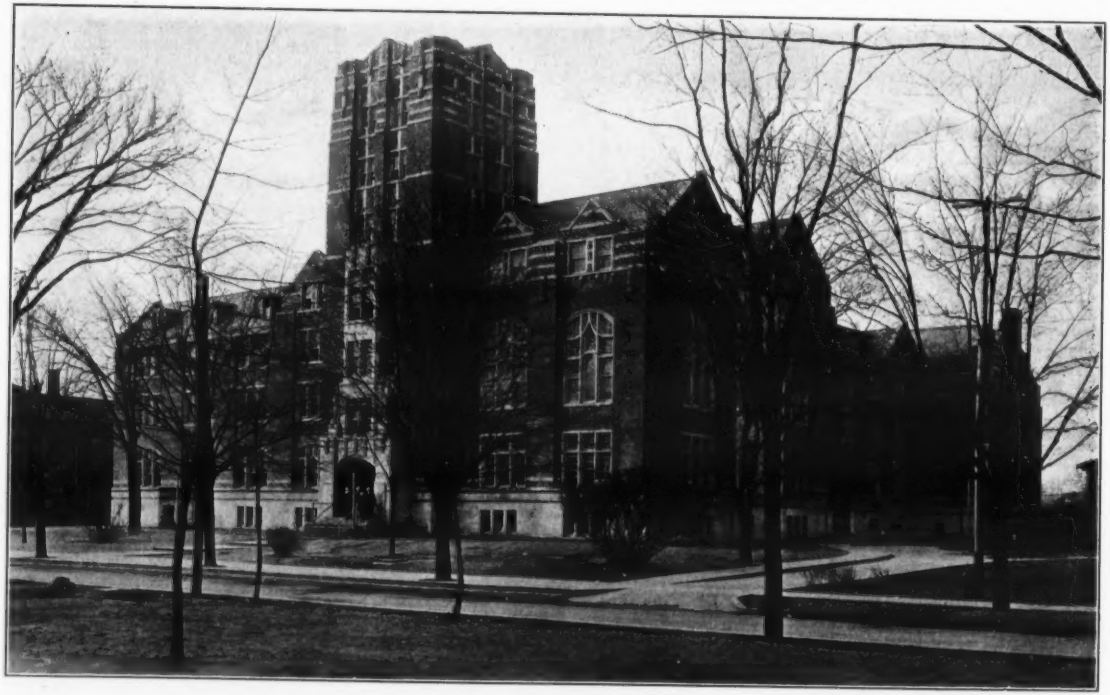

MICHIGAN UNION CLUB HOUSE.

NEW ENGINEERING BUILDING.

BULLETIN

OF THE

Society for the Promotion of Engineering Education

Published under the supervision of the Publication Committee:

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POINTS OF GENERAL INTEREST AT THE UNIVERSITY OF MICHIGAN.

BY J. RALEIGH NELSON,

Associate Professor of English.

The meeting of the S. P. E. E. to be held in Ann Arbor, June 29 to July 2, will give the members of that society interested in the development of state universities, an opportunity to see the University of Michigan at a most significant moment in its history. President Harry B. Hutchins, the able successor of President Angell, will have closed his period of service and given his valedictory at the commencement exer-

cises the week preceding our meeting and President Burton will have been installed in his new office less than a week. The ten years of President Hutchins's administration has been a period of rapid growth, not only of the student body but especially in material equipment. President Hutchins, who was the first of Michigan's own graduates to act as president, has been strikingly successful in consolidating the great body of alumni and inspiring them with a vision of their opportunity for serving their alma mater. During his ten years of service, the alumni have given at least $2,000,000 in cash and property estimated at $1,000,000 more. These gifts include the Alumni Memorial Building, the Hill Auditorium, the Martha Cook and the Betsy Barber Residence Halls for Women. There was, in addition, the achievement of the Michigan Union Building, a gift of over $1,000,000 contributed by over thirteen thousand alumni, whose largest gift was $10,000—a tribute to their love for the great President James B. Angell, to whose memory it was dedicated. Lately, too, have come large gifts for the less material but no less essential, scholarships, as, for example, the gift of $200,000 worth of Detroit property by Regent G. D. Barbour for the Education of Oriental Women. President Hutchins's insistence on the building up of material equipment has, in the light of the enormous growth in enrollment of the past two years, been almost prophetic. At least, it has shown how well he understood the needs of the University. Fortunately, too, he was practically always successful with the Legislature of the State in inspiring confidence in his judgment. What he asked for they gave.

Some of the most important buildings erected during his administration are: the Library, Hill Auditorium, Power House, Contagious Hospital, Science Building, Homœopathic Children's Ward, Newberry, Martha Cook, and Betsy Barbour Residences. Altogether the building equipment added since 1910 aggregates approximately two million, four hundred and fifty thousand dollars. To his credit should also

be given the completion of the Union Building costing over a million more.

At the very close of his administration, the Legislature voted $2,200,000, which will make possible the new Model Training School and the $1,850,000 hospital already in process of construction.

Members of the S. P. E. E. who visit Ann Arbor in June, therefore, will find Michigan in the midst of a pretentious building program, enough of which has been already realized to make the lines of development for the future rather evident. Some of the buildings in which visiting members may be interested are as follows:

Engineering Building.

The New Engineering Building is, with the exception of the Science Building and the Library, the largest building on the campus. The total floor-space is 144,444 square feet. It forms with the engineering shops the two sides of the Engineering Quadrangle. In addition to class rooms, it contains lecture rooms, administrative offices, the naval testing tank, the special laboratories for mechanical and electrical engineering, the automobile, hydro-electric, and physical testing laboratories. Although the building was erected as recently as 1902, and was later largely extended, the engineering college has already so completely outgrown it that a very large extension is planned for the near future.

Chemistry Building.

The chemistry building provides for the teaching of chemistry to students in all of the various departments of the university and for the technical work in the school of pharmacy and the course in chemical engineering. The whole of an admirably designed, strictly fireproof building erected in 1909 at a cost slightly over $300,000 is devoted to those purposes. The building is rectangular in shape, 230 × 130 feet, with two central courts, and is four stories high. It contains

125 rooms and has a total floor area of 104,500 square feet. The exterior was designed to give a maximum amount of window space and artificial illumination by tungsten lamps has been installed on an equally generous scale. Ventilation is cared for by eight fans capable of changing the air in the entire building every eight minutes, and the heating is controlled by thermostats in each room. The hood facilities are excellent. Hydrogen sulphide, high pressure steam, compressed air, and distilled water as piped to the laboratories needing them, and special electric circuits have been freely provided. The storerooms occupy a stack six stories high, including basement and attic, placed in the central crossbar of the building, with provisions for dispensing on three main floors.

The library occupies the center of the south side of the building and is a handsomely finished room with shelf capacity for ten thousand books and seats for 85 readers. The chemical library contains 8,400 volumes and is especially rich in complete sets of journals. One hundred and eleven journals are currently received. The chemical museums on the third floor contain valuable exhibits illustrating chemical manufacturing processes.

In addition to a full supply of routine materials and apparatus for work in general, analytical, organic, physical, pharmaceutical and technological chemistry, facilities are offered for advanced study along all of these lines.

Natural Science Building.

The natural science building is a four-story fire-proof building erected in 1915 at an expense of $375,000 for the use of the departments of botany, forestry, geology, mineralogy, psychology and zoölogy. The approximate measurements are for the north side 243 feet, for the east side 263 feet, for the west side 150 feet; and the south side, with a series of breaks, is made to conform in general to the diagonal walk and trees. A greenhouse is located on the south side at the east corner.

The building encloses a court 120 feet across. A corridor about 700 feet in length runs through the center of each floor. There is a clear span of approximately 23 feet between the corridor and the exterior walls on both the campus and court sides. The total capacity is approximately 155,000 square feet of space. The form of construction gives unusually large windows, and these combined with the light court in the center allow excellent illumination of all rooms. The corridor floors are finished with terrazzo, the floors of the rooms with cement. The building contains 270 rooms. Each department is given a section from roof to basement. At the southwest corner on the diagonal walk is located a lecture room seating 500, with a preparation room attached. The lecture table is built in sections; each section runs on rollers and can be taken to any part of the building for the preparation of material. These sections fasten to stanchions set in the concrete floor; at the stanchions all sorts of plumbing and electric supplies are available, including low-voltage storage-battery current. An isolated and well-lighted library for all departments in the building is located above the lecture room. This portion of the building is carried on structural steel.

There is a vacuum cleaning system throughout. Alternating current is used for power and for lighting and is available everywhere. There is a unit system of distribution of direct current at 220 volts and special outlets for direct current at 75 volts are well distributed. The building is well ventilated with complete air supply and exhaust system. A special separate exhaust is provided for the toilets and certain other rooms. Pneumatic switches and diaphragm motors are used to control ventilation. The temperature is controlled by thermostats.

The Observatory.

The university observatory was founded in 1852, through the liberality of citizens of Detroit, and is known as the Detroit Observatory. It is situated half a mile northwest of the

university campus. The observatory has recently been remodeled and contains a new telescope and dome, which cost about $35,000. The instrument is a reflecting telescope with a 37⅝ inch parabolic mirror. In its light-gathering power this telescope is in a class with the Lick and Yerkes refractors, while for ordinary astronomical photography it is at least as efficient as those instruments. The brick tower and copper covered dome rises sixty feet from the basement floor and is forty feet in diameter. A two-story brick addition, 112 feet long and 40 feet wide, connects the new dome and the old observatory and contains offices, class, and computing rooms.

The University Power Plant.

The new university power plant, which cost $350,000, is a fine example of modern power-plant construction and is available for instruction and for use. It is proposed in the future to obtain a supply of water from the river by means of an electrically operated pumping station erected near the river. The feed-water heaters supply hot water to the boilers and also for domestic purposes. Coal is brought directly from the Michigan Central Railroad to the plan over an electrically operated road, delivering the coal to a storage bin, whence it is taken by a coal-crusher and delivered to the steel bunker above the stoker-hoppers. The ashes are carried by a pneumatic conveyor to a bunker over the track, from which they are loaded directly into cars. Tunnels are provided for the underground distribution of steam, hot water, and electrical energy. There is available alternating current at 2,300 volts, 320 volts for lighting, and other voltages for power; also direct current at 220 volts and 500 volts; high and low-pressure steam, and hot water.

Hill Auditorium.

The Auditorium, erected as a memorial to the late Regent Arthur Hill, of Saginaw, who left the sum of $200,000 to the university for that purpose, was formally dedicated Wednes-

day, June 25, 1913. The building has a seating capacity of nearly 5,000, which makes it one of the largest concert and lecture halls in the world. Particular attention has been paid to acoustic properties, and the fine concerts of the May Festival seasons have proven that this difficult problem has been almost perfectly solved. There is no seat where one is not able to hear with the greatest ease. The building is finished in tapestry brick and terra cotta. It contains, in addition to the great auditorium, a number of offices and check room dressing rooms for the choruses, and a great hall on the second floor, about the walls of which the Stearns Musical Collection, containing 1,400 instruments, has been placed. It also contains the Frieze Memorial Organ. The building was erected at a cost of $285,000.

Alumni Memorial Building.

The Alumni Memorial Building, which is on the southeast corner of the campus, was built from subscriptions made largely by members of the Alumni Association as a memorial to the distinguished alumni of the university who have served the country in war and in peace. The total cost was about $200,000. It is the headquarters of the Alumni Association and contains as well the art collections of the university. It was dedicated May 11, 1910, with an address by the Hon. Curtis Guild, of Massachusetts, and was opened in May, 1910, with an exhibition of Oriental and American art under the charge of the Hon. Charles L. Freer, of Detroit, from whose collection many of the pictures came.

The New Library.

The new library building of the University of Michigan was formally opened on January 7, 1920. It cost, with its equipment, $615,000. The architect was Albert Kahn, of Detroit, the designers of the Hill Auditorium and the Natural Science Building. It is 177 feet in breadth, 200 feet in depth, and is four stories high. The old book stacks which were in-

corporated in the new building are five stories, the new ones eight stories high, and are so built that they may be extended to fifteen. There are seats in the new structure for one thousand readers, distributed among the reading and study rooms, seminars, and stacks. It will house one million volumes without extension, and nearly a million more with the extensions planned for. The reading room, a noble room, 170 feet long, 50 feet wide, and 50 feet high, in the center of the barrel-vaulted ceiling, will seat 300 readers. While everything has been subordinated to utility in the building, the artistic features are well worth noting. The paintings by Gari Melchers in the reading room, the stained glass windows, the casts of the Della Robbia Choir, and the Parthenon frieze, the panels by Thomas di Lorenzo are all worthy of the noble building of which they are a part.

Points of Specific Interest to Engineers.

As educators, the visiting body of the S. P. E. E. will, we are sure, be interested to observe the university at this time when it is coming out into a new era of material prosperity. But naturally as engineering educators most of our visitors will find their particular interest in those things which affect the engineering profession and engineering education. They will find the engineering college rapidly outgrowing its accommodations on the campus and planning hopefully for great and significant expansion in the near future. More significant still, they will find the engineering college in the midst of a thorough reorganization of its courses of study along broader and more distinctly fundamental lines. They will be interested, too, to learn of the plans for a closer cooperative relation between the college of engineering and the industrial interests in the state. The faculty of the college, fully alive to the significance of the changes which must soon come, and soberly aware of the problems involved, look forward to the coming of so influential a body of educators as the S. P. E. E. as a great source of inspiration and guidance.

We shall hope to afford our visitors in return every opportunity to see any of the things of interest to them which may be a part of our own material equipment or may be made available by our proximity to great engineering centers like Detroit, Toledo, and Jackson.

Some of the points of interest in our own college are as follows:

Sanitary Experiment Station.

The sanitary experiment station, located immediately north of the general hospital, is well worth a visit from those interested in a plant which handles large volumes of sewage, and which shows what can be done in the installation of effective teaching and research equipment at moderate cost. One of the city sewers is carried to the station, where sewage disposal plants have been in operation constantly under skilled supervision for the past six years. A septic tank, an Imhoff tank, trickling filters, sand filters, and contact filters have been and are in constant operation.

Highway Laboratory.

The highway laboratory is temporarily installed in the north half of the old campus power house. It is the official laboratory of the Michigan State Highway Department. Equipment is installed for all standard tests of brick, stone, gravel, bituminous materials, cement and for soil analysis in connection with sand-clay and earth roads. There is most complete coöperation between the State Highway Department and the university, the testing work for the state and the road materials survey of the state being under charge of Professor J. H. Bateman.

One very interesting feature of the highway work is the series of short period, intensive courses in highway engineering and economics of highways conducted as graduate courses between December 1 and March 15, each year under the direction of Professor Arthur H. Blanchard.

Steam Laboratory.

The steam laboratory, which is located in the north end of the engineering building occupies a floor space of some 13,000 square feet. It is devoted to experimental work in connection with the testing of engines, boilers, pumps, fans, air compressors, refrigerating machinery, gas and gasolene engines. The very complete and modern central power and heating plant of the university located on Washington Street is also used for the laboratory tests.

Hydro-Mechanical Laboratory.

The hydro-mechanical laboratory, which is located in the north end of the engineering building, is equipped with a pair of tanks each having a capacity of 600 cubic feet. These are mounted on large scales, making it possible to weigh accurately all the water from a 1,000,000 gallon pump. There are also water wheels and centrifugal pumps of different types. As this laboratory is connected through a canal with the large ship tank it is possible to draw from a large water supply when conducting experiments.

In addition to the hydro-mechanical laboratory in the engineering building, there is a flume for the measurement of large volumes of water, installed as part of the Argo Dam on the Huron River. There are five hydro-electric plants on the river within a few miles of Ann Arbor, a very complete gaging station at which various types of self-registering gages are installed and other features of interest. Michigan is a water-power state. There are many large plants in operation and over one hundred small low-head powers. Engineers interested in this subject may secure data from Professors H. W. King and C. O. Wisler.

The Automobile Laboratory.

The automobile laboratory is located north of the engineering building. In the same building and just south of the

automobile laboratory will be found the space ready to receive the tractor laboratory recently donated by the Cleveland Tractor Co., of Cleveland, Ohio. The automobile laboratory consists of an engine-testing section, a dynamometer room and a section for the display and demonstration of automobiles, motor trucks and their component parts. The engineer testing section contains a complete equipment of engines, selected with a view to affording the student experience with various typical successful types. This section is equipped with prony brakes, water dynamometers and one fan dynamometer. The dynamometer room contains a complete Diehl electric dynamometer, together with special fuel measuring devices, tachometers, air meters, pyrometers, gas analysis apparatus, manograph, and complete accessories necessary for instructional testing and advance research work. In the display and demonstration section are gathered together complete operating and cut-out chasses, various types of engineers, cut-out transmissions, rear axles, differentials, clutches, carburetors, ignition systems and other automobile parts and equipment. This apparatus is especially mounted to show its operation and design and is used as demonstration study, and test equipment for the regular automobile courses. It further serves as a permanent educational exhibit open to the public.

Experimental Ship Tank.

The experimental ship tank, 300 feet long, 22 feet wide, and 10 feet deep forms the basement of the east wing of the new engineering building. Its capacity is 16,000 barrels. In this tank are tested paraffine models of boats of various sizes, which are prepared in the model room and workshop at the north end. The only other tank of this kind in the United States is at the Washington Navy Yard. The facilities offered by this tank were used extensively by the government during the war. It may be of interest to note that Michigan was the first school to offer systematic courses in marine engineering. Professor Cooley, who was an Annapolis man, gave

two courses in ship building and marine engineering from the first of his connection with the college. The regular department of marine engineering was organized in 1900.

Engineering Shops.

The engineering shops occupy about 30,000 square feet of floor space. They consist of the wood and pattern shop, the foundry, the forge shop, and the machine shop and instrument shop with the usual equipment. The newly instituted central shop is of some special interest, as it gives promise of great usefulness to the university at large. It is intended to give the required service to all departments of the university requiring the making of instruments or any general repair work. The shop, which at present has only six machines, will by June be fully equipped. Both in fitting out this shop and in obtaining more modern tools for purposes of instruction, the university has taken advantage of the opportunity afforded by the Caldwell Bill for obtaining machine tools from the Government Salvage Board.

Electrical Engineering Laboratories.

The electrical engineering laboratories comprise a dynamo laboratory and a photometric laboratory located on the ground floor of the north end of the new engineering building and the communication laboratories on the ground floor of the south end of the same building.

The terminals of almost every piece of apparatus in all these laboratories have been brought out to sockets, and the distribution of power is controlled through a plug and socket system. This arrangement gives great flexibility and requires that all connections be made by the student himself, but provides the means by which those operations may be quickly and easily performed.

The dynamo laboratory contains a full complement of direct and alternating current apparatus of various types and sizes. As in all of the electrical laboratory work, special em-

phasis is here laid upon the development of the student's ability to analyze the phenomena which he observes in the operation of electrical machinery. To this end, and with the aim of developing the personal initiative of the student, a large number of moderate-sized machines have been provided in order to give each student intimate contact with the apparatus.

The laboratory has on exhibit several dynamos of very early type which are of historic interest.

The photometric laboratory is equipped with four fixed photometer bars, one of them for precision work, all provided with suitable auxiliary devices. There are also three portable photometers for making illumination surveys in the field. A single-mirror selector permits of measurements on large light sources. The laboratory has a complete and modern collection of lamps and accessories including mercury, magnetite, and flame carbon arcs, refractors, reflectors of all varieties in glass and metal, and a floor light projector.

The communication laboratories which are equipped for fundamental work in telephone, telegraph, and radio communication have all the usual talking, signaling, and testing apparatus. In addition, it is equipped with a Vreeland Sine Wave Oscillator having a frequency range of 250 to 4,000 cycles per second. This apparatus in connection with a 50-mile artificial line arranged so that it can be used either as a loaded or non-loaded cable, affords an opportunity for making a fundamental study of transmission phenomena at voice frequencies.

For special studies a small magneto exchange and a small automatic exchange are available. The university private branch exchange which is adjacent to the laboratories, is also available for inspection and special studies.

In the radio laboratory the old pioneer rotary spark transmitting set is still in service. The more modern types of transmitting and receiving apparatus are furnished largely by the Signal Corps of the United States Army.

Physical Testing Laboratory.

The physical testing laboratory occupies two adjoining rooms, 29×54 feet and 27×54 feet respectively, on the ground floor of the south wing of the building, and is equipped with apparatus especially designed for testing the strength of materials used in engineering work. This equipment includes a 100,000 pound Olsen testing machine and one of 200,000 pounds capacity built by Riehle Brothers. Both of these machines are adapted to tensile, compressive and transverse tests, and are run by direct-connected electric motors. An Olsen torsion machine of 240,000 inch-pounds capacity, also equipped with direct-connected motor, is used in determining the torsional strength of shafts and axles. Impact tests are made on an Olsen impact machine, and Upton Lewis toughness testing machine is used for endurance tests. The cement-testing laboratory is equipped for making the ordinary tests of cement and concrete. In addition to scales, sieves, briquet molds and accessories, there are two briquet testing machines made by Olsen, and a uniform load beam testing machine, especially designed for the University of Michigan with a capacity of 85 tons, and adapted to beams of reinforced concrete, wood, or steel of any span up to 12 feet.

Chemical Engineering Laboratories.

The chemical engineering laboratories occupy twenty-five rooms on the first and second floors of the chemistry building. The gas and fuel laboratory includes: (1) a general laboratory for gas analysis; (2) a calorimeter room equipped with ten bomb calorimeters; (3) a large and well-ventilated photometer room with an excellent photometer supplied with several types of standard lights and test burners; (4) an instructor's laboratory; and a laboratory for advanced students.

The assay laboratory comprises an ore-crushing and sampling room with modern equipment, a room for the preparation of assay charges, a balance room and a number of assay furnaces.

The furnace rooms, the pyrometer room and the metallographic, the paint and varnish, and the pulp and paper laboratories are all thoroughly supplied with modern equipment and are well worth a visit of inspection by those interested.

The evaporator laboratory is of particular interest since it represents a successful experiment on the part of the university in the establishment of coöperative relations with the industries of the state.

On May 19, 1917, an offer was made to the university by the Swenson Evaporator Company to install and equip a laboratory for the study of the design of evaporators and similar problems in chemical engineering. The plan was discussed at considerable length by the board of regents, as certain new principles were involved, and the offer was finally accepted by them on July 20, 1917.

Work was started in October, 1917, to prepare the old boiler house for the laboratory. Because of war conditions only one evaporator was installed at first, and that not till the spring of 1918. Two more followed in the spring of 1919, and the various pieces of accessory apparatus at different times. The amount expended by the Swenson Evaporator Company for apparatus and erection, exclusive of research or operation, is to date between $15,000 and $20,000.

By the terms of the agreement the apparatus, once installed, is the property of the university. It is available before everything else for university work, instruction, demonstration, and research. The Swenson Evaporator Company has the privilege of doing their own research work, provided it does not conflict with the university's work, with the reservation that any fundamental principles discovered or data of general scientific importance obtained are public property even if the work was done by the company.

In the time since the apparatus was installed both classes of work have been carried out. Several chemical engineering students, graduate and undergraduate, have taken work in the laboratory every semester. The Swenson Evaporator

Company has been developing a very extensive program of research, most of which will be available for publication. One paper representing nearly the whole of one year's work by the company, will be published in the spring of 1920. Less than 15 per cent. of the work done by the company has been detail work for their own private information.

Camp Davis.

In 1908 and 1909 the regents of the university came into possession of about 1,600 acres in Cheboygan County, Michigan. A part of this came as a gift from Colonel Charles Bogardus and his wife, Hannah W. Bogardus. Since 1909 the regents have purchased, from time to time, other tracts until they now have in their possession an area of about 3,200 acres. In recognition of the kindly interest of Colonel Bogardus and his wife, the entire area now owned by the university is called the Bogardus Tract. The surveying camp, situated on these lands, is known as Camp Davis, in recognition of Joseph Baker Davis, who established the camp in 1874 and conducted it for over thirty years, many years before any other university followed the example thus set by Michigan. The university lands lie, generally speaking, between Douglas and Burt Lakes, having a frontage of four and one half miles on the former and one and three fourths miles on the latter lake. The camp is six miles east of Pellston on the G. R. & I. Railroad, eight miles northwest of Topinabee on the Michigan Central Railroad and thirteen miles southwest of Cheboygan. Camp Davis is located on the south shore of South Fishtail Bay, Douglas Lake. The quarters of the students, teaching staff, physician, store, office, etc., are located along the shore in a double row of steel buildings almost parallel with the water line of the lake.

The camp is designed fundamentally to give students practice in surveying, yet they are given opportunity to design simple structures and to help carry out the plans thus made. In this way, a good harbor has been provided. A cistern for

containing water pumped from the well has been built and a pipe line extends therefrom to the main street of the camp, thus bringing the well water practically to each tent. A 4 h.-p. kerosene engine furnishes power for pumping water and running a generator for lighting the camp. Two concrete storehouses have been built and a concrete platform for adjusting instruments has been laid. A complete sewer system with septic tank was installed in 1915.

An instrument building, fourteen feet by twenty-eight feet, was built in 1917 and affords excellent facilities for the storage, care and issuing of instruments. A concrete sidewalk was laid along the north side of the main street of the camp in 1918 and the street transformed into a stretch of model gravel road.

The director of Camp Davis extends a cordial invitation to all members of the Society for the Promotion of Engineering Education who are interested in surveying camps, or the teaching of surveying generally, to visit Camp Davis after the session at Ann Arbor. A train leaves Detroit on the Michigan Central Railway each evening at nine. This reaches Cheboygan the following morning at about seven. The camp will make arrangements to meet delegates at Cheboygan if notice is given in advance. By telegraphing Professor C. T. Johnston, Topinabee, Michigan, Camp Davis, the message will be telephoned to headquarters on Douglas Lake.

The Excursion to Detroit.

Although the University of Michigan is situated in a small residential city, it is, fortunately for our meeting, very conveniently located with reference to several of the great manufacturing centers of the country. Detroit, Toledo, Jackson, Flint, Lansing are all within short distances and easily accessible. One day or part of one day will be devoted to a visit to some of the points of interest to engineers in Detroit. While the plans are not yet, of course, very definitely worked out, the list of possibilities is attractive. There are the auto-

mobile factories for the mechanical engineers, the power house and substation of the Detroit Edison Company for the electrical engineers, the Waterworks Pumping Station, one of the largest in this country and the sewer system upon which Detroit is spending $1,000,000 a month for the civil engineers, Park, Davis & Co. Frederick Stearns, the great paint and varnish industries and the coke industries will be of interest to the chemical engineers, and the shipyard of the Great Lakes Engineering Works at River Rouge to the marine engineers. The Detroit River Tunnel, the Livingstone Channel, the Michigan Central passenger terminal, one of the most complete classification yards in the United States, and many other features will be attractive as points to visit for those whose interest is more general.

Our Place of Entertainment.

The Michigan Union Building, the new $1,000,000 club house, built by the alumni of the university will be the headquarters of the society during its sojourn in Ann Arbor.

No more ideal place can be imagined for the entertainment of a convention of men like the S. P. E. E. than the Michigan Union. The great club house, which with its furnishings has already cost over a million dollars, offers every possible accommodation furnished by the best Metropolitan hotels with a number of features added that will appeal especially to a crowd of college men. The attractive guest rooms of the club will furnish sleeping accommodations for the visiting delegates, supplemented if need be by the neighboring fraternity houses. The large dining room will make it possible for all to sit down together at meals, which will add greatly to the social enjoyment of the convention. The lobby and concourse are spacious enough to make an ideal lounging and meeting place for our delegates, and there are eleven private dining rooms and numerous committee rooms for meetings of small groups for convention business. The assembly room, which seats 600, and the small lecture rooms will also be found to

be well adapted to the needs of our convention. During our stay, all the facilities of the club house will be available to guests, the library, barber shop, billiard room and bowling alleys, and the swimming pool which can accommodate 200 swimmers at one time. Directions will be given in a later number of the BULLETIN as to how to make reservation of accommodations at the Union.

The engineering college of the University of Michigan is most enthusiastic over the prospect of welcoming the members of the S. P. E. E. to Ann Arbor. We hope a great many will come and that they may feel that their coming was both profitable and pleasant.

THE CLASSICS FOR ENGINEERS.

BY EVAN T. SAGE,

Professor of Latin, University of Pittsburgh.

In recent years there has been a vigorous discussion of the value of the classics as preparation for various professions, and such men among engineers as Dean Cooley, President Drinker, Professor Chatburn, Mr. Steinmetz and Professor Vedder have urged that the classics may contribute something to the training of the engineer. Mr. Rudolph Hering, however, has taken the opposite position in an article published in the *Engineering News-Record* for June 26, 1919, and this paper called into existence the present discussion. I shall not do more than answer some of Mr. Hering's arguments, leaving to others the task of presenting in greater detail the positive argument for the classics.

Mr. Hering's title is "Training in Latin and Greek Not Best for Engineers." If he means by this that there are other forms of training that are better for engineers than the classics, we shall all no doubt agree with him. Certainly no classicist nowadays would argue that everyone should study the classics, or that the classics should form the universal and inevitable element in education of every type. But if he means that it is not best that engineers should study the classics at all, then I shall dissent.

Mr. Hering believes that the thing of prime and universal importance is the knowledge of one's mother tongue, and admits that Latin and Greek might be taught in a manner to contribute very much to the engineer's knowledge of English. The student could learn from such a course the meaning of many Latin and Greek roots that are still productive, as well as the meaning of many phrases and words that have been taken over bodily into English. Mr. Hering will be

glad to know that every first year book in Latin published in the last five years is based on the belief that the first and most immediate profit to be gained from the study of Latin is the increased mastery of English, and that the last beginning book in Greek is written for the sole purpose of acquainting the student with some of the Greek roots that are used by scientists today, and that the book can not be used as an ordinary beginning book in Greek at all. The teaching of Latin, particularly, is being revolutionized in this country by the growing recognition of the value of the ancient language in understanding the modern. More than half—some authorities say as high as 80 per cent.—of the ordinary English vocabulary is of Latin origin, while the technical terms that are being added every day are overwhelmingly Latin and Greek. Think of the new words that the war brought into everyday use--words like aeroplane, submarine, terrain, mandatory, personnel—practically all of Greek or Latin origin. Think too of the manufacture of compounds. The old Anglo-Saxon prefixes and suffixes are dead; the Latin, alive. In this respect it is, as someone has said, the English that is the dead language, not the Latin. Latin lives, if in no other way, as the productive part of the English speech.

Mr. Hering's method of teaching the classics, then, has many supporters among teachers of the classics, and his objection to Latin and Greek in large measure disappears. He will be glad to know of the increasing number of courses all over the country where the value of Latin for English is emphasized. The Carnegie Foundation recommends a special course in Latin for the teacher in the seventh and eighth grades and the high school English teacher. The Dorchester High School of Boston some years ago introduced Latin into its commercial course, and the precedent has been followed in Cincinnati, in the evening schools of Pittsburgh and elsewhere, with great success. A class of students in Maine, unable to progress in the ordinary way in Latin, last year made remarkable advancement in studying Latin for the sake

of English. Many educators believe that this is to be the prevailing method of studying Latin in the future. But we have found out that 90 per cent. of the words in the Cæsar and Cicero read in the high school are productive of English derivatives, in numbers ranging from one up to more than six hundred in the case of one word at least. This shows that to make even a little Latin useful in this way we do not need a special course or special vocabularies, but only a different method, and it is to be feared that the adoption of a special course like that described by Mr. Hering will not prevent the occurrence of such grammatical blunders as *this phenomena* and *seperate,* to use Mr. Hering's examples. This result will more certainly be gained by the older method, modified somewhat to put more emphasis on the study of English derivatives. Many experiments have been tried in teaching derivatives by working backward from English rather than forward from Latin, but all have proved tedious and unsatisfactory, and this method misses the other good results that follow from the study of the classics direct.

So progressive Latin teachers are doing every day—not in quite Mr. Hering's way, it is true—precisely what Mr. Hering wants them to do, and his argument answers itself.

According to Mr. Hering, one of our "pet reasons" for urging the retention of Latin and Greek is to get the ability to read these languages easily in the original. This, he says, we fail to accomplish. But I know of no teacher of Latin who would suggest that the sole reason for holding on to the classics is that his students are able to read them easily. It is true that few can read Latin easily after completing a high school or even a college course, but that is not the aim of any teacher of my acquaintance, and I for one believe that if we cared to make that our purpose we could accomplish it. We prefer other goals. This does not mean that I agree with Mr. Hering that all the ancient literature worth considering is available in modern translation. No one who has ever really translated a literary work will seriously claim that his

translation can or does have the same qualities as the original. Ancient literature is not available in translation, and never can be. Such works as those of Vitruvius on architecture or Frontinus on aqueducts, which convey information, may be translated with reasonable success, but no translation has ever produced the effect of a tragedy of Æschylus or an oration of Cicero.

Another "pet reason" according to Mr. Hering for the study of the classics is to get mental discipline. Probably there has been more criticism of the classics on the ground of their claim to train the mind than on any other. For years we have been told that there is no such thing as mental discipline or training. Mr. Hering, however, finds fault with us, not because our claim is unjustified, but because the discipline we impart is inferior to that of science, as grammatical laws suffer exceptions while natural laws do not. The subject of formal discipline is still in the stage of debate, and until experimental psychology gives us more certain knowledge than we now have, comparisons of the quality of various kinds of discipline are dangerous. This much may be said, that certain objects have primarily content value, others interest value, and still others procedure or method value, and that few if any other subjects combine these three forms of value to the same degree as the ancient languages. We may question too whether this discipline of science is constantly in the minds of teachers of biology or chemistry as it is in the minds of teachers of Latin or Greek. Unless it is a constant and definite aim it may be doubted whether the disciplinary value of science as often taught is superior to that of the classics as usually taught.

Finally, Mr. Hering gives to students of engineering and allied professions the credit for practically everything that has been done to advance modern civilization. Recent progress, he says, is due to professions that have not been based on Latin and Greek rather than on those that are so based. But medicine and law, architecture and sculpture,

have progressed without the help of the classics. Such a statement is rash. Modern architecture is based entirely on that of Rome. The arch, the dome and the vault were used if not invented by Roman builders, and the work of Roman architects has been the means of instruction of every succeeding generation.

Furthermore, it should be remembered that the scientific spirit, which brought to pass all the triumphs of modern sanitation, agriculture, and other professions, is not the child but the parent of modern science, whether pure or applied, and I should want to hear the claims of pure science before I conceded the claims of applied science to the credit for progress. The scientific spirit had its origin in the necessity felt by the scholars of the Renaissance to interpret classical texts. The Renaissance itself was in origin nothing but a revival of interest in the classics. From this came increased interest in the facts of the universe and better information on astronomy and geography than the middle ages could supply. Intellectual curiosity was another product of the Revival of Learning, and it in turn had such different consequence as the discovery of America and the Protestant Reformation.

There is a fundamental though unexpressed idea which determines Mr. Hering's point of view, that the engineer is a being set apart from the beginning, and clearly differentiated from ordinary human beings. If this could be granted, it would naturally follow that the training of the engineer would be from the cradle such as to make of him a perfect engineer, no matter what else were excluded. Granting that the classics as often taught at present, though not as they may be taught, give to the engineer little that he can put to immediate use, we believe that the study of the classics by any method may contribute a great deal to the engineer who may occasionally participate in human relations that are not in the narrow sense those of the engineer. Simply because a man is an engineer is no reason why he should be excluded from the privilege of studying the classics. I for one do not

favor a universal requirement of Greek or Latin, but I am not able to tell in advance what persons will profit by their study and what persons will not. I know of no reason why the engineer as such should not profit thus. Our faith in the value of the classics as a means of education is based on the fact that there is perhaps no other subject that will serve the student in so many different ways. The peculiar advantage of the classics lies in their combination of values. A study of etymology from the English standpoint may increase one's knowledge of English, but will scarcely increase one's appreciation of the continuity of history. Mathematics may be superior as a discipline, but as usually taught will not contribute much to one's esthetic development. The study of strength of materials may furnish one with valuable facts and methods, but usually will not lead to a profounder consciousness of one's civic and national obligations. But the study of the classics may do all these things, and more. Better control of the English language, a sense of the continuity of history and the evolution of society, valuable training (even if not the most valuable), esthetic appreciation, useful knowledge, and local and national pride, may all be products of the study of the classics. Few will gain all these things, but still fewer will miss all of them. But in addition, for the student of law, medicine, pharmacy and theology, Latin, and to a less degree Greek are vocational subjects. For every one who is called on to use the English language with force, accuracy, clearness and propriety, Latin is almost a necessity. President Hollis has recently found in Periclean Athens the origin of art, literature, philosophy and even science. No one who reads Cicero or Pliny can fail to be impressed by the multitude of resemblances between our own society and that of ancient Rome. Practically every political and economic problem that we face confronted the ancients, and in their experience we have an invaluable resource. Even the character of Wilhelm of Prussia seems familiar to readers of Cæsar.

Granting that ancient achievements in the fields of astron-

omy, agriculture, geography, surveying, mathematics and architecture have been so completely absorbed in modern doctrine as to be unrecognizable, shall we still deny to the engineer his right to the rich heritage of the past? The student who takes such a brief course as that Mr. Hering recommends to us would gain much in his ability to differentiate between apparent synonyms and in his appreciation of the real meanings of English words, but he would also miss much. Shall we deny to him the opportunity to make himself master of grammar, to smooth his path toward the acquisition of French and Spanish, to widen his mental horizon by contact with other forms of expression than hand-books and contracts? Shall we deny to him, because he is an engineer, the opportunity to become even imperfectly acquainted with two great literatures and two great civilizations? Modern civilization is the result of the fusion of Hebrew religion, Greek philosophy and democratic instincts, Roman law and instinct for order and discipline, as these things were appropriated by the vigorous peoples of northern Europe. To two of these three elements in modern civilization only the student of the classics holds the key. No master key exists. No other means of entrance can be found. To change the figure, no substitute has ever been devised for Latin and Greek as a means of understanding the Greek and Roman civilizations, and there is no way of understanding our own without understanding them. No historian can teach ancient history without knowing the classics; no one can interpret modern literature without knowing the ancient. I see no reason for depriving the engineer of this opportunity. He must play his part on the stage of modern life; let him be as well equipped as he can be. All the things the study of the classics can bring him should be his. Antiquity is part of his inheritance. Rome the Eternal City is the symbol of something imperishable—something that is a solid and substantial foundation for modern civilization.

EDITORIAL.

The Secretary read the interesting description in regard to the University of Michigan published in this number of ENGINEERING EDUCATION, and especially that part which deals with the entertainment of the members of this Society at the next annual meeting. This was so interesting and fascinating that it seemed one of the pleasantest things that could happen would be to attend this meeting. To quote from the article by Professor Nelson:

"No more ideal place can be imagined for the entertainment of a convention of men like the S. P. E. E. than the Michigan Union. The great club house, which with its furnishings has already cost over a million dollars, offers every possible accommodation furnished by the best Metropolitan hotels with a number of features added that will appeal especially to a crowd of college men. The attractive guest rooms of the club will furnish sleeping accommodations for the visiting delegates, supplemented if need be by the neighboring fraternity houses. The large dining room will make it possible for all to sit down together at meals, which will add greatly to the social enjoyment of the convention. The lobby and concourse are spacious enough to make an ideal lounging and meeting place for our delegates, and there are eleven private dining rooms and numerous committee rooms for meetings of small groups for convention business. The assembly room, which seats 600, and the small lecture rooms will also be found to be well adapted to the needs of our convention. During our stay, all the facilities of the club house will be available to guests, the library, barber shop, billiard room and bowling alleys, and the swimming pool which can accommodate 200 swimmers at one time."

Further proof of the pleasantness with which meetings of

the Society is associated is given by Dean Butler, who recently wrote to this office as follows:

"Most of us regard attendance at these meetings in the light of a very enjoyable vacation."

INFORMATION DESIRED.

The Secretary desires the correct address of the following members:

Adamson, K. F.	Linville, C. P.
Bevan, W. A.	Mark, R. M.
Chedsey, W. R.	Mavity, V. T.
Cross, Hardy	Merrill, J. L.
Dalburg, F. A.	Miller, Hugh
Dickinson, L. P.	Ockerblad, A. M.
Doland, J. J.	Robertson, J. E.
Dreyer, C. F.	Rusk, W. W.
Ely, John A.	Shutt, J. C.
Ford, H. C.	Stivers, E. R.
Hamlin, H. L.	Sturges, F. L.
Harvey, J. W.	Storm, E. R.
Holmes, P. E.	Tanzer, E. Dean
Johnson, W. F.	Veal, C. B.
Kamrass, Benjamin	Wing, S. R.
Lewis, F. J.	Wolfe, W. S.

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June 21, 1919.

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PROFIT AND LOSS ACCOUNT.

Balance, trading account		$1,030.67
Annual meeting, 1918	$ 426.89	
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Treasurer's office	331.36	
Secretary's office	1,000.00	
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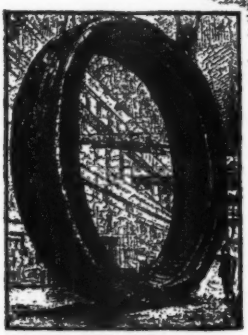

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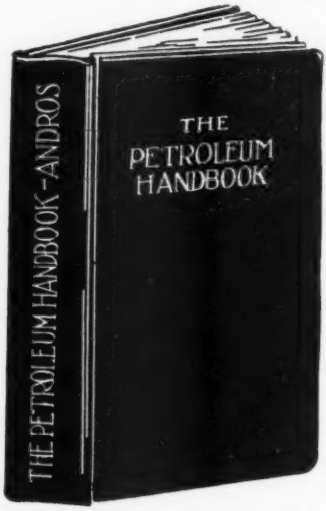

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